

REMARKS

Claims 1-7, 9-13, and 15-20 would be in the case upon entry of this amendment.

The Office action rejected the original claims over several references. Applicants have amended the independent claims to more clearly distinguish from the applied references, and have added another independent claim and several dependent claims that also are submitted to be patentably different from the applied references.

Applicants explain in their patent application that they maintain a desired signal-to-noise behavior by establishing electrical fields that range from a minimum field E_C , at which the signal-to-noise ratio is relatively high but the device is still clear of saturation, to a higher field E at which the signal-to-noise ratio may be lower but still is at least 50. In the disclosed example, this is achieved by varying the voltage across the device, using a variable voltage power supply 70. It is important that the disclosure teaches maintaining a desired signal-to-noise behavior, while operating clear of saturation, rather than just increasing or decreasing the amplitude of the electrical charge, or the signal, generated in response to incident x-ray dose. See, e.g., Fig. 6 and column 7, line 10 to page 9, line 3.

This teaching could not be found in the applied references, as understood, where:

- **Ikeda**, et al. U.S. Patent 6,323,490 shows in Fig. 3 a box labeled "Programmable H.V. Voltage," but no explanation could be found of the exact function or purpose of this item;
- **Yamane**, et al., U.S. Patent 6,330,303 was cited as a secondary reference for its mention of the use of amorphous selenium "formed in a thickness from 300 to 600 μm ." No teaching could be found of varying the electric field in the selenium in the way disclosed in this patent application;
- **Yamada**, et al. U.S. Patent 6,163,029 also was cited as a secondary reference, in this case for its discussion in column 14 of increasing the bias voltage if the dose of incident X-rays is small, and *vice versa*. However, no teaching could be found of varying the bias voltage to control the signal-to-noise behavior and to stay clear of saturation, rather than only to control the generated electrical charge, and thus perhaps control the signal amplitude but not necessarily the signal-to-noise behavior and the saturation issue; and

- **Kramer**, et al. U.S. Patent 5,379,336 also was cited as a secondary reference, for its mention of non-destructive testing in column 2 and of x-ray energy ranges in column 6. However, no teaching could be found of the use of voltage ranges to achieve the results disclosed in this patent application.

In brief, no teaching could be found in the applied prior art of maintaining a signal-to-noise ratio of at least 50, while staying clear of saturation, by varying the electric field in the device with a variable voltage power supply in the disclosed manner.

Amended claim 1 now specifies that the recited range of voltages establishes electrical fields in the sensor layer that range in value from a minimum electrical field E_C , at which a signal-to-noise ratio of the device is relatively high but the device operates below a saturation point, to a higher electrical field E at which the signal-to-noise ratio may be lower but is at least 50, and that the variable power supply is set to a selected voltage within the specified range, which selected voltage matches a selected object being imaged with the claimed digital imaging device. The remaining amended claim in independent form is method claim 9, which recites similar features of the claimed process.

New claim 15 is an independent claim in method form, and also addresses the disclosed feature of controlling the electric field in the sensor layer to achieve an important result in a way that is not believed to be taught in the references applied against the original claims, but does not call for a "dielectric layer."

If a petition for an extension of time is required to make this amendment timely, this paper should be considered to be such a petition, and the Commissioner is authorized to charge the requisite fees to our Deposit Account No. 03-3125. The Office is hereby authorized to charge any additional fees that may be required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a further telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Entry of this amendment and allowance of this application are respectfully requested.

Respectfully submitted,



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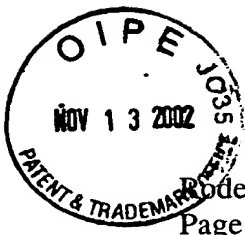


EXHIBIT A

(Marked-up amended claims, and new claims)

1. (Amended) A digital imaging device comprising:
a top electrode layer;
a dielectric layer under the top electrode layer;
a sensor layer under the dielectric layer, comprising a photoconductive layer and a plurality of pixels, each pixel comprising a charge-collecting electrode;
a thin film transistor readout matrix connected to the charge-collecting electrodes; and
a variable power supply adapted to provide a range of voltages between the top electrode layer and the readout matrix;
said range of voltages establishing electrical fields in said sensor layer ranging from a minimum electrical field E_c , at which a signal-to-noise ratio of the device is relatively high but the device operates below a saturation point, to a higher electrical field E_s , at which the signal-to-noise ratio may be lower but is at least 50; and
said variable power supply being set to a selected voltage within said range matching a selected object being imaged with said digital imaging device.

9. (Amended) A method for providing a broad dynamic range for a digital imaging device and controlling a signal-to-noise behavior of the device to maintain a signal-to-noise ratio of at least a selected level and prevent saturation of the device, said device comprising a top electrode layer; a dielectric layer; a sensor layer comprising a photoconductive layer and a plurality of pixels, each pixel comprising a charge-collecting electrode; a thin film transistor readout matrix connected to the charge-collecting electrodes; and a power supply for supplying a voltage between the top electrode layer and the readout matrix; the method comprising varying the voltage between the top electrode and the readout matrix to provide an acceptable signal-to-noise ratio over a greater range of exposures than provided with a single voltage; said step of varying said voltage comprising varying the voltage to establishing electrical

fields in said sensor ranging from a minimum electrical field E_c at which the device has a relatively high signal-to-noise ratio but still remains below a saturation point, to a higher electrical field E , at which the device has a signal-to-noise ratio that may be lower but still is at least 50, and said varying further comprising ultimately setting said voltage at a level within said range matching an object being examined with said device.

--15. (New) A method of operating a digital imaging device to image an object in a non-destructive testing process, said digital imaging device comprising a top electrode layer, a sensor layer comprising a photoconductive layer and a plurality of pixels, each pixel comprising a charge-collecting electrode, a thin film transistor readout matrix connected to the charge-collecting electrodes, and a power supply for supplying a voltage between the top electrode layer and the readout matrix; the method comprising the steps of selectively varying the voltage between the top electrode and the readout matrix to provide a signal-to-noise ratio of at least 50 over a range of exposures and to select a voltage within said range that establishes an electric field in said sensor layer of at least a minimum value E_c and causes the digital imaging device to operate below a digital electronic saturation point, said selected voltage corresponding to a selected signal-to-noise behavior in which the signal-to-noise ratio is at least 50 and matches a selected object being imaged with said device in said non-destructive testing process.--

--16. (New) A method as in claim 15 in which said voltage is in the range of 1.5 kV and 3.0 kV.--

--17. (New) A method as in claim 16 in which the signal-to-noise ratio increases from below 200 to above 300 before said saturation point is reached as said voltage changes from 3.0 kV to 1.5 kV.--

- 18. (New) A method as in claim 15 in which said selected voltage causes said minimum electrical field to corresponds to a signal-to-noise ratio in excess of 300.--
- 19. (New) A method as in claim 15 in which said selected signal-to-noise behavior is maintained at exposures in the range of 10KeV to 10 MeV.--
- 20. (New) A method as in claim 15 including the step of presetting a number of selected voltages for use with respective types of specimen.--